## APPENDIX E. COMPUTING MAXIMUM NOISE LEVEL ($L_{max}$) FOR A SINGLE TRAIN PASSBY

This appendix provides procedures for the computation of $L_{max}$ for a single train passby, for those readers desiring such procedures. Table E-1 contains the equations to compute $L_{max}$. The procedure is summarized as follows.

- Collect the following input information:
  - $SEL_{ref}$'s from Chapter 6, specific to both the locomotive type and car type of the train
  - $N_{locos}$, the number of locomotives in the train
  - $N_{cars}$, the number of cars in the train
  - $L_{locos}$, the total length of the train's locomotive(s), in feet (or $N_{locos}$ ×unit length)
  - $L_{cars}$, the total length of the train's set of rail car(s), in feet (or $N_{cars}$ ×unit length)
  - S, the train speed, in miles per hour
  - D, the closest distance between the receiver of interest and the train, in feet
- Compute $L_{max,locos}$ from the locomotive(s) using the first equation in Table E-1.
- Compute $L_{max,cars}$ from the rail car(s) using the second equation in Table E-1.
- Choose the larger of the two $L_{max}$'s as the $L_{max}$ for the total train passby.

**Table E-1 Conversion to $L_{max}$ at the Receiver, for a Single Train Passby**

| Source | Equation |
|---|---|
| Locomotives | $L_{max,locos} = SEL_{locos} + 10\log\left(\frac{S}{50}\right) - 10\log\left(\frac{L}{50}\right) + 10\log(2\alpha) - 3.3$ |
| Rail Cars | $L_{max,cars} = SEL_{cars} + 10\log\left(\frac{S}{50}\right) - 10\log\left(\frac{L}{50}\right) + 10\log[2\alpha + \sin(2\alpha)] - 3.3$ |
| Total Train | $L_{max,total} = \max\left[L_{max,locos} \textit{ or } L_{max,cars}\right]$ |

D = closest distance between receiver and source, in feet

L = total length of measured group of locomotive(s) *or* rail car(s), in feet

S = vehicle speed, in miles per hour

$\alpha = \arctan\left(\frac{L}{2D}\right)$, in radians

**Example E-1. Computation of $L_{max}$ for Train Passby**

A commuter train will pass by a receiver of interest and its $L_{max}$ is desired. For this train, the following conditions apply:

$SEL_{ref}$ = 92 dB for locomotives and
= 82 dB for rail cars

$N_{locos}$ = 1

$N_{cars}$ = 6

S = 43 miles per hour

D = 125 feet.

The locomotive and rail cars each have a unit length of 70 feet. Therefore,

$L_{locos}$ = 70 feet

$L_{cars}$ = 420 feet

Using the equations in Table E-1,

$\alpha_{locos}$ = 0.27

$\alpha_{cars}$ = 1.03

and the resulting Lmax's are as follows:

$L_{max,locos}$ = 84 dBA

$L_{max,cars}$ = 74 dBA

$L_{max,total}$ = 84 dBA.

**End of Example E-1**